FAMINE FOODS:

THE NUTRITIVE VALUE OF SOME UNCULTIVATED FOODS USED BY BHILS DURING RECENT FAMINES.

(1).—PRELIMINARY.

In July 1901 we received from Mr. F. Noel Paton samples of some of the uncultivated foods collected and used by the Bhils during the famine, along with a series of valuable notes stating the mode of use, the quantities found necessary to maintain life, and other essential details. We have thus been afforded an opportunity of investigating the very interesting subject of the quantity and nature of some of the natural vegetable products which were found by the semi-savage Bhils to be sufficiently nutritious to sustain them through a long period of famine. The investigation may be of interest to the economist in showing the nutritive value of some drought resisting foods, and to the physiologist in affording some further information upon the question of the energy requirements of human beings, and of their powers of digesting and utilising coarse vegetable products.

The samples and notes were originally sent to Mr. Paton in response to an unofficial request to the Government which procured them through Mr. S. M. Barucha, P.C.S., District Deputy Collector, Panch Mahals, and Mr. F. B. Garda, Famine Officer, Dholka. The samples received numbered 18 in all, Mr. Barucha sending eight and Mr. Garda ten. In the following list we give the native names which were upon the specimens sent to us and also the proper botanical names of the plants, so far as we have been able to ascertain them, the latter having been supplied to us by Mr. Paton from the Indian Government, and kindly revised by the Director of the Royal Botanic Gardens, Kew. The identification of the various specimens has delayed the publication of the analyses.

So far as we are aware the only previous analytic study of foods of this class is that published by Professor Church, who in his "Foodgrains of India, 1896 with Supplement, 1901" (Chapman and Hall), refers to some of those now under consideration. When dealing with the composition of these foods we shall have to compare our results with his.

(2).—LIST OF SPECIMENS RECEIVED.

A. *Sent by Mr. Barucha.*

Samo (Panicum colonum).
Podru or Kherkhodu (Panicum javanicum).
Zinjroo (Indigofera glandulosa).
Mali, or Manchi, or Manebhi (Eleusine Ægyptiaca).
Samlaseru or Samla Seru (Panicum, species of).
Kasaiya (Coix lachryma-Jobi).
Kodri, a husked preparation got from Samo or Podru or Samla seru.
Katchra, a wild fruit allied to Kakri.

B. *Sent by Mr. Garda.*

Bid, Root of Gunderda (Scirpus grossus, var. Kysoor?).
Ghitolas, fruit of Pœna or Kumplis (Nymphæa Lotus, var. pubescens).
Kanda Root, root of Pœna, or Ghitola, or Kumplis (Nymphæa Lotus, var. pubescens).
Theck Root (Cyperus bulbosus).
Samo (as above).
Battair, or Batterioo, or Golio (Panicum, species).
Anchu Manchu or Anki Manchi (Eleusine Ægyptiaca).
Endoo Pendoo (Panicum, species).
Oru Koru or Puchadioo (Panicum, species).
Doda Flowers, pollen grains and anthers of (Dregea volubilis, Benth).

Of the above, we have analysed all the samples with the exception of Samla-Seru, Kanda root, and Oru Koru, which appear to be of minor importance of foods.

(3).—DESCRIPTION OF THE FOODS, AND THEIR MODE OF USE.

Samo (Panicum colonum).—A grain oval in shape with pointed ends. It has a green capsule which is covered by a roughish straw-coloured husk. It is neither very hard nor very gritty. It has a taste somewhat suggestive of oats. Mr. Garda's specimen contained some impurities, mostly bits of grass. Mr. Barucha's specimen was much purer.

Mr. Barucha writes:—"It is found in cultivable fields (especially black soil) that remained "uncultivated last year. The Samo collected by the Bhil women in fields is half mixed with "earth, from which, being a very small grain, it is not separated without a lot of trouble. "Pure Samo is collected just after the monsoon, when the seed has not yet fallen on the ground. "Hundreds of Bhils were seen last year from August to October going from field to field with a "basket and a flapper, and filling their baskets with Samo got direct from the waving grass by "means of the flapper. I send a sample of the flapper; though rudely prepared and of rough "materials, it well serves the Bhil's purpose. After October, when the grass was dried up, the

"Samo seeds fell off to the ground, and since then the only mode of collecting the seed was by "sweeping it off the ground. As said above, it was half mixed with earth; to clear it the "Bhils had first to pour it on the ground from a height of 3 or 4 feet, thus blowing off the "chaff; second to pound it with a pestle; and third, to winnow it. The result would be pure "Samo seed as sent in the sample. Generally out of the quantity collected, about half is the "real Samo, the other half being earth. This pure Samo is then ground, mostly by itself, and "sometimes mixed with maize or gram, if available. The flour is then baked into bread and "eaten with either chutney or onions, or some forest fruit or boiled leaves. Samo is a soft "grass seed, and is therefore considered by the Bhils not to have the same nutritive value as "maize. The Bhils, therefore, require a larger quantity of Samo than maize to satisfy their "hunger, viz., nearly half as much again. I have found that from 1½ to 2 lbs. of maize is daily "required for a working man of average health; the Samo required by the same man is from "2¼ to 3 lbs. Samo bread is sweet in taste and much relished by the Bhils, who consider it to "have 'cooling properties.' Those who are not used to it get diarrhœa at first, but later on "they thrive on it. Within two months of the Bhils commencing to use Samo, I was agreeably "surprised to see them everywhere fat and strong, there being few traces left of their hard "sufferings in the previous year."

Mr. Garda writes:—"'Samo' seed is obtainable about two months after it commences to "rain. It is gathered in good quantity (about one maund by a strong man), in the beginning, "viz., in September and October, by means of an oval-shaped frame-work made of bamboo or "wood, with cloth attached to it, and called 'Wanjee' or 'Dhanu.' In November it commen- "ces to fall off, and people gather it from the ground and continue to do so till the hot season "is over, when about three seers at the most is collected by a strong man. After it is brought "home it is exposed to the sun for a couple of days, and then rammed or thrashed. Then the "husks are separated. This process is repeated once or twice over, and the grain in its eat- "able condition is finally separated from the husks, and when 'Chhas' is available. 'Chhas' "or 'Rab' (Kanji) is prepared out of it, or the grain is ground and bread prepared out of the "flour. Samo grows mostly in black soil, and when cheap it can be obtained at two to three "maunds a rupee. Out of one maund about 18 seers of grain can be taken out. An adult "requires from 1½ to 2 seers of this grain a day for food. Even in years of plenty poor people "such as Dheds, Wagris, and Shangris resort to it, and high class Hindus make use of it on "the days of fasting. It is better in taste than any other wild grain, and is not found to be "so much injurious to the health as others. Those who are accustomed to it have been found "to be in good condition, while other people find it producing costiveness and lethargy. Samo "grass grows more thickly in black soil than in yellow, and is greatly relished by cattle."

Kodri.—This is husked Samo. It is a small hard grain without husk, light in colour, and with few evident impurities.

Mr. Barucha writes:—"Except Mali and Zinjroo all other grass-seeds can be made into "'*Kodri*,' as well as bread. Kodri is prepared by raking off the husks of Samo or Podru or "Samla-Seru by roughly grinding it. It is then cooked like rice with water and salt, and "eaten with pulse, if any, or chutney. It is called 'Rab,' or Ghena,' a half fluid food much "relished by the Bhils. I send a sample of Kodri of Samo."

Mr. Garda sends no sample.

Amount of daily ration is not stated.

Podru (Panicum javanicum). *Description.*—A grain in all respects very similar to Samo.

Mr Barucha writes:—"'Podru,' or 'Kharkhadu,' is found in waste land, compounds, "below babul trees, and even in forests. It is collected in the same way as Samo, and cleaned "and prepared similarly. The same quantity is required to satisfy hunger. The only "difference between the two is that while Samo grows in cultivable fields, 'Podru' grows in "waste land and compounds, and is less sweet in taste."

Mr. Garda sends no sample.

Batterioo, Battair or Golio (Panicum sp ?).—A yellow grain of elongated shape, some with and some without capsules, mixed with two other grains, the one a brown grain resembling the yellow one in shape, the other a small, almost black seed, with hard resistant punctated capsule and very difficult to break. There are some impurities in the specimen consisting of seeds of other grasses and earthy matter.

Mr. Barucha sends no sample.

Mr. Garda writes:—"This grass-seed called 'Batterioo' or 'Golio' was unknown to the "people till the famine appeared; when it was resorted to by the poor people. They com- "mence to collect it from October and continue doing so till the monsoon sets in. In the "beginning of the season, the grass is cut and then thrashed, and the grain is collected. As "the time goes on the seed falls off the grass, and it is collected by means of sweeping the "ground. In the commencement, an adult gathers about 15 seers of the seed while in the latter "part of the hot season one is able to get only three or four seers after the dust is separated. "The grain is thrashed and the husks separated. Then it is rammed and prepared into 'Ghes' "or 'Rab' (Kanji), or ground into flour and bread is prepared of it. One requires about 2½ "seers a day to live upon. In taste it is similar to Samo but is not strengthening. However, "it is relished by the poor people.

"This Golio or Batterioo has generally a mixture of other kinds of seeds; the red seeds "in it are called 'Damro' and very small white grain in it called 'Charkalioo.' When cheap "it can be had two to three maunds a rupee."

Endoo Pendoo (Panicum sp?).—These seeds closely resemble Samo. Of it Mr. Garda writes:—"This seed is collected and made use of in the same way as Battair or Golio. An "adult repuires about 2½ seers (3⅓ lbs.) to keep him up. It has the taste of Golio and is not "strengthening."

Samla-seru (Panicum sp ?).—This specimen consists of small flat oval glistening seeds of a dark green colour with longitudinal lighter markings, which are easily crushed, and have a peculiar taste. It is contaminated by being mixed with other grains and with earthy particles.

Mr. Barucha writes:—"Is a small seed, dark in colour. It resembles the cultivated grain "Samli, just as Mali resembles Bavto. It is found only in hills and stony upland. It is collect- "ed in the same way as Samo and prepared by itself into bread which is palatable with milk. "The quantity required for satisfying the hunger of a working man is the same as Samo, viz., "from 2¼ to 3 pounds a day. It is, however, not found everywhere like Samo and is a rare "grass-seed."

Being a rare seed it seemed to us that to analyse it was hardly necessary.

Oroo Koru or Puchadioo (Panicum sp?).—Ooro Koru closely resembles Samo. Of it Mr. Garda writes:—"This wild grain is obtained only in a few villages, from October to the end "of summer. It was not known to the people before the famine appeared. One strong man "can gather about a maund a day in the beginning of the season, and about five seers in the "hot season when it gets scarce. It is thrashed and rammed and husks separated from the "grain. From one maund of these seeds only about 10 seers of grain is obtained. It is ground "into 'Ghos,' or 'Rab' (Kanji) is prepared from it. It is not strengthening."

We made no analysis of it.

Anchu Manchu (Eleusine Ægyptica).—A small brown grain like millet seed but rather smaller, hard and gritty. Our samples contains few impurities. Mr. Barucha's specimen is sent under the name of Mali.

Mr. Garda writes:—"This grain appears in October and is obtainable thoroughout the "open season. Before famine time it was unknown to the people. A strong man can collect "about 15 seers a day when abundant and about four when it gets scarce. From October to "January, people cut the Anki Manki grass, thrash it and take out the seed. After January "they collect it by means of sweeping the ground when it dwindles off. From black soil, seeds "black in colour, and from yellow soil, red in colour, are obtained. The grain is first rammed "and then ground, and bread prepared of the flour. An adult requires about 1½ seers a day. "It is not good in taste and one finds difficulty in chewing it as it is hard as sand, and people "have no liking for it. The after effects are bad, it is constipating; the abdomen gets large "and hard, and several times the urine of the eater stops. It was resorted to only this year "for want of any other eatable grain."

Mali or Manebhi (Eleusine Ægyptiaca).—Identical with the last, but with a considerable admixture of another grass seed, which in appearance resembles Samo, and a considerable proportion of earth.

Mr. Barucha writes:—"Mali or Manebhi is a very small red grass seed found only in "goradu waste soil. It is collected and cleaned like Samo, but has no husks. It is not mixed "with any other grass-seed, and it is made into bread, which assumes a reddish hue. It is like "the cultivated grain 'Bavto,' sweet in taste, said to be even sweeter than Samo, and strength "giving. It is much relished by the Bhils, who call it the best grass-seed for human food, but "it is not commonly found like Samo. Its growth is only in brown soil, and in small quanti- "ties, and cattle moreover are very fond of Mali grass. Its grass does not grow more than "three or four inches in height, while that of Samo and Podru goes up to three feet."

Zinjroo (Indigofera glandulosa).—Small, roughly spherical, dark green seeds, mottled with black, and looking not unlike minature plovers' eggs. They are very hard, and have a bright yellow kernel. It has a characteristic hottish taste.

Mr. Barucha writes:—"Zinjroo is a small, round seed, black and green in colour, and not "having husks like Samo or Podru. While both the latter grow on grass, Zinjroo grows on "small plants in winter in black soil whether cultivable or waste. It is collected in the same "way as maize crop, *i. e.*, cut, stacked, dried, threshed and winnowed. It is ground into flour, "but it is so sticky that it has to be mixed with Samo before baking into bread. There should "be more Samo than Zinjroo in the mixture, or at least half to half, before good bread is made. "While Samo and Podru are said to be 'cool,' Zinjroo is considered by the Bhils to be 'hot.' "They do not like it, and fall back on it when there is nothing else to eat in the house. As "they say, it is simply for stuffing the belly without relish. Its nutritive qualities are inferior "to Samo. The quantity required for food is the same, but, as said above, it is seldom if ever "eaten by itself."

Mr. Garda sends no sample of it.

Kasaiya (Coix lachryma-Jobi).—Eliptical seeds, sharply pointed at one end, olive green to brown in colour, extremely hard, so much so that they cannot be broken between the teeth.

Their size is rather larger than ordinary barley. They contain a white kernel of great hardness and of no flavour.

Mr. Barucha writes:—"Kasaiya is a large seed collected from plants or shrubs that look "like reeds and grow on banks of nalas or streams. The seed is enclosed in a hard shell which "has to be broken with a rod or has to be roughly ground. If mixed with Samo or Maize it "can be turned into bread, but it is mostly cooked like rice. It tastes like wheat, and is con- "sidered nutritious. A pound and a half of this Kasaiya would suffice for a man per day, "but it is generally not used alone, and is not resorted to as long as Samo is to be had."

Ghitolas, Fruit of Poena or Kumplis (Nymphæa Lotus var. pubescens).—A poppy-like ovary, filled with small greyish brown seeds, with few impurities. The seeds have no marked taste, and are not very gritty.

Mr. Barucha sends no sample.

Mr. Garda writes:—"Ghitolas are the fruit of 'Poena,' or 'Kumplis,' (big white flowers, "smaller than lotus, growing in tanks). The seeds of this fruit are used in ordinary years "also as food by the Padharias, and other people living near the Nal-Kantha, and in the in- "terior of the Taluka. It is very often eaten in its raw state when the fruits are green, but "when they dry up, the seeds are taken out, ground, and prepared into bread. Some of the "people take it in the form of Kanji, after boiling it with water. About one seer of this food "is sufficient to keep one up. If more is taken it produces cold and cough."

Kanda Root—Poena or Ghitola or Kumplis (Nymphæa Lotus var pubescens).—It consists of a capsule about the size of a pigeon's egg, it is of irregular shape, it has a hard rough woody "husk, and at one end has a fringe of fine hair-like processes.

Mr. Garda writes:—"This Kanda is the root of Poena or Ghitola fruit plant, and is dug "out from the Nal tank, and other tanks also. These Kandas are baked or boild with water, "and then eaten by poor people with salt. It is better in taste than Bid, but has not the same "effect as Bid."

We made no analysis of Kanda.

Doda Flowers (Dregea volubilis).—Mr. Garda writes:—"This yellow powder is taken out "of 'Doda' a kind of flower growing in the village of Durgi and a few other villages in the "Dholka Taluka. People make use of it in prepairing 'Dhoklas' (small thick bread). It is "not injurious to health. An adult can keep himself up by taking 1½ seers of it a day at the "most."

Mr. Barucha sends no sample.

Theck Root (*Cyperus bulbosus*).—These oval seeds, which are obtained in the manner described by Mr. Garda, have the following characters. They are of about the size of barley, with a thin hard husk of a whitey-brown colour, which contains a somewhat hard but friable grain. No characteristic taste. In the sample, as received, there was a considerable amount of fine brown meal, which was evidently derived from the breaking up of some of the seeds.

Mr. Barucha sends no sample.

Mr. Garda writes:—"'Theck' is the root of certain grasses growing near the Nal tank "and on salt marsh in the Dholka Taluka. After it is dug out of the ground, the mud is re- "moved from it by washing it. It is then burnt, which process removes the black (thin) husks "from over it, and leaves the beautiful grain (as per sample No. 4). In all years and at all "times, except the monsoon, people in the Nal Kantha are in the habit of digging this root out, "as it is greatly prized even by people of superior classes for use on days of fasting. When "it is not sold in the Bazars, people grind it into flour and eat it in the form of bread, which "is very palatable. Some make use of it in the form of 'Ghes' or 'Rab' (Kanji). One can "collect about five seers of Theck a day, and an adult requires from 1½ to 2 seers of it to keep "him up. Theck has its bad effect too, as it is found costive, and too cold for the constitution. "Most of the Theck is sold by the diggers for equal amount of wheat or Bajri."

Bid, Root of Gunderda (Scirpus grossus var Kysoor?).—Masses of what appear to be the brown underground stems of a grass with rootlets adhering, and, in some cases, pieces of the above-ground grass stems.

Mr. Barucha sends no sample.

Mr. Garda writes:—"'*Bid.*' It is the root of 'Gunderda,' a sort of grass, and it is obtain- "able in any amount in the Nal tank, north-west portion of the Dholka Taluka.

"People commence with digging it out as soon as the water in the Nal tank begins to dry "up, and continue taking them out till it rains the next season.

"It is found in its raw state, mixed with clay (as per sample No. 1). It is thrashed for "removing the clay, the hairy roots are then burnt with their own grass, then they are again "thrashed and the roots (as per sample 1A) are collected. This process is repeated again to "completely remove the hair on the roots. The roots are then powdered by a hand or grinding "machine, and a sort of light yellow flower is sieved out of the powder and bread prepared out "of it.

"I submit the refined roots as well as the roots found from the soil in its raw state.

"There are professional eaters of this 'Bid' root and 'Ghitolas' (sample No. 2) called "Padharias living in some of the villages, *i.e.*, Durgi, Meni, Sial, Donadthal, &c., near the Nal. "They live on it for half the year even in ordinary times. The 'Bid' root was unknown to "almost all the people of this Taluka except the Padharias and other people residing on the "Nal up to the famine year; when about three-fourths of the villages of the Dholka Taluka "and about 200 more of Sanand Viramgam and Dhanduka and of Katheawad States had to "resort to it for the preservation of their poor and cattle. The Padharias require of 'Bid' "food from 1½ to 2 seers per male and about 1¼ to 1½ seer per female to keep them up. This "food has been seen in their cases, to wonderfully keep up their health and constitutions. But "the other people, who resorted to it during the famine, perhaps not knowing the cleaning "process, have been seen by me to suffer a good deal by eating it. They have swollen feet and "hands, and enlarged abdomens. Some of them died from the effects after the rains; and "some managed to live and thrive on Samo and other grain seeds.

"On enquiry it appears that one seer of 'Bid' flour if mixed with half a seer of wheat or "barley flour, gives good nourishment to unaccustomed eaters of 'Bid.'"

Katchra.—This consists of a seed capsule and seeds resembling that of a poppy-like plant whose identity we do not know. Regarding its use along with grains, Mr. Barucha writes: "These grass seeds, coupled with forest produce which the Bhil well knows how to use, have "made a good substitute during the year for the maize, owing to the failure of the harvest. "Nearly a dozen varieties of forest produce are consumed by the Bhils, the most common "among them being Katchra, a wild fruit allied to Kakri, red flowers of the Simla tree, Omra "fruit, Timerva fruit, Pomad, Zarakhli, Kalli Regari, Fang, and Nalo. . . . . I send a sample "of Katchra, the wild fruit which, being dried and stacked, is ordinarily used by the Bhils as "a vegetable with bread or rice."

We made no analysis of Katchra.

(4).—Chemical Composition of the Foods.

A.—*Methods of Analysis.*

The analyses were made under our supervision by Mr. Alfred Patterson, Chemical Assistant at the Laboratory of the Royal College of Physicians, Edinburgh. All analyses were made in duplicate and only accepted as correct when the two results closely agreed. The methods employed were as follows:—

1. *True sample.*—A fairly large sample was carefully ground and thoroughly mixed before a sample for analysis was taken.

2. *Moisture.*—A sample was dried at the temperature of 110° Centigrade until it became of constant weight; the difference between the weights before and after were taken as the amount of water in the sample.

3. *Proteid.*—This was estimated by making a nitrogen determination by Kjeldahl's method and multiplying the result by 6·25. In the case of Zinjroo it was checked in the manner described under that substance.

4. *Facts and Oils.*—These were estimated by means of Sohxlet's method.

5. *Fibre or Cellulose.*—Five grammes were taken and boiled for half an hour with 1·25 per cent. H_2SO_4; the beaker was then filled to the top with water, allowed to stand 12 hours and the fluid was siphoned off, the deposit washed and then boiled for half an hour with 1·25 per cent. KHO and washed in the same way. It was then collected on a weighed ash free filter paper, dried at 110° C. and weighed, then ignited and the ash weighed. By subtraction the woody fibre was determined.

7. *Carbohydrates other than Cellulose.*—These were estimated by difference, the weights of all the estimated constituents were added and the total deducted from the total weight of the sample, the difference being taken as the amount of these carbohydrates.

8. *Digestibility of the Proteids.*—This was tested in Samo, Battairioo and Zinjroo by ascertaining how much of the proteid was undissolved after prolonged peptic digestion. (*See* page 21).

9. *Digestibility of Carbohydrates.*—This was tested in the same specimens by ascertaining how much of the carbohydrate was converted into glucose by prolonged digestion with taka-diastase. (*See* page 21).

B.—*Results of Analysis.*

In Table 1, the composition of the various samples analysed is given, and for purposes of comparison the composition of some common cereal foods is added.

TABLE 1.

Showing Composition per 100 grammes of famine foods and some cereals.

Name.	Proteid.	Fat.	Carbohydrate.		Ash.	Water.	Energy Value.
			Soluble.	Fibre.			
	Grms.	Grms.	Grms.	Grms.	Grms.	Grms.	Calories.
1. Samo	10·68	5·20	51·16	14·68	7·35	10·93	301
2. Podrn	10·50	4·60	42·11	17·02	16·95	8·82	258
3. Kodri	14·00	4·99	63·03	2·84	5·82	9·32	362
4. Battairioo	11·90	3·60	47·89	14·22	12·93	9·46	279
5. Endoo Pendoo	11·81	4·17	46·59	15·02	13·35	9·06	278
6. Anchu Manchu	12·87	2·08	64·03	4·86	4·58	11·58	335
7. Mali	8·44	1·45	38·97	5·71	36·95	8·48	207
8. Zinjroo	36·12	3·69	38·75	10·90	2·99	7·55	341
9. Kasaiya*	18·81	6·2	59·55	1·28	3·4	10·74	378
10. Ghitolas	9·3	·78	66·78	5·81	6·32	10·94	319
11. Doda Flower	14·62	7·60	41·08	23·50	4·50	8·70	299
12. Theck Root	2·27	·58	82·46	1·51	1·58	11·60	353
13. Bid Root†	4·12	1·00	76·18	6·80	3·40	8·50	338
Barley Meal	10·5	2·2	66·3	6·5	2·6	11·9	335
Oatmeal	16·1	7·2	66·8	·9	1·9	7·3	406
Rice	8·0	·3	78·8	·2	·4	12·3	359
Wheatmeal	13·8	1·9	71·9	·9	1·0	11·4	369

* With husk removed.

† Sample 1 A (purified root).

The above table shows that these famine foods may be arranged in three groups (1) those with proteid more or less in a proportion similar to that in ordinary cereal foods; (2) those with more proteid than ordinary cereal food; and (3) those with less proteid than ordinary cereal food.

1. The first group contains :—

(i) The seeds of the various species of Panicum. These closely resemble in composition such a cultivated cereal as barley but differ from it in containing less soluble carbohydrates and more fats, fibre, and ash.

Professor Church writes of the Panicum colonum under different names from those reported to us by Mr. Garda and Mr. Barucha. The names he uses are Shama Millet, Oplismonus colonus (Kunth), Shama, Sarwak and Shamak. From his description and from his using the name of Panicum colonum we have no doubt but that what he writes about is the same as the Samo submitted to us. He says :—"This millet, sometimes called 'Wild Rice,' or 'Jungle Rice' "is a poor food; it is used, however, in some places where it grows freely (*e.g.* in Champaran) "by a considerable number of labourers as a usual article of diet. It is very good fodder-grass." He gives the following analysis of the seeds :—

Water	12·0
Albuminoids	9·6
Starch	74·3
Oil	·6
Fibre	1·5
Ash	2·3

His specimen gave a smaller percentage than ours of proteids, fats, fibre, and ash and a greater amount of carbohydrates. Since these last are calculated by difference the discrepancy between our figures is obviously the result of the higher percentage of the other substances in our specimen. Our specimens were analysed as received by us and the high fibre and ash results are probably due to the persistence of the husk and to a certain admixture with earth due to the mode of collection.

(ii). The seeds of Eleusine Ægyptiaca, of which two specimens were received, that from Mr. Garda being labelled Anchu Manchu, and that from Mr. Barucha as Mali or Manchi. The latter contained a manifest admixture with earth which it was impossible to separate and which accounts for the very large ash. An attempt was made to separate this by blowing, but the ash was only reduced from 36·95 per cent. to 21·04 per cent.

(iii). The seeds of Nymphæa lotus, Ghitolas, and

(iv). The pollen of Dregia volubilis—Doda flower.

In these four foods the proteids vary from 8·4 in Mali to 14·62 in Doda flower. They have from ·78 to 7·6 per cent of oil. Ghitolas is the poorest in fat, having only ·78 per cent, while Doda flower is the richest with 7·6 per cent. Soluble carbohydrates are found to be in widely varying amount; Ghitolas is the richest with 66·78 per cent: Mali, the poorest, with only 38·97 per cent.

The small proportion of carbohydrates in these foods results in their having an energy-value smaller than that of the ordinary cereals. Mr. Garda's specimens of Anchu Manchu and Kodri alone have an energy-value larger than that of barley meal, which has the smallest energy-value of those ordinary cereals included in the table. Other points of difference between these eight foods and the average cereal are, that they as a class generally contain more fibre, and a large percentage of ash, from 4·58 to 36·95 per cent., while the cereals have from ·4 to 2·6 per cent. This is to be explained by the great admixture of sand and earth particles with many of the grains due to the method in which they are collected.

2. The second group, characterised by being richer in proteid than the ordinary cereals, contains two examples: the seeds of Indigofera-glandulosa, Zinjroo and the seeds of Coix lachryma-Jobi, Kasaiya. The former, as will be seen in the table, has no less than 36 per cent. of proteid, an amount three times larger than that found in the average cereals. To determine how much of the nitrogen was in the form of extractives and how much in proteids, 3·27 grms. of Zinjroo were repeatedly extracted with alcohol, but only ·067 per cent. of nitrogen was thus dissolved, only 1·1 per cent. of the whole, so that practically all the nitrogen is in the form of proteids. In containing this large proportion of proteid, Zinjroo is in composition more like one of the pulses, as peas or lentils, than like a cereal. In addition to being exceptionally rich in proteid, Zinjroo contains a fair amount of fat, and a relatively small amount of carbohydrates.

Professor Church writes of Zinjroo under the following names:—Indigofera glandulosa, Indigofera frumentacea, Vekhariyo, Barbed, Gavancha Malmandi, Baragadam, Barapatalu, and Broomidapu. He states:—"The seeds of this species of Indigofera greatly resemble in "alimentary value those of Indigofera cordifolia and Indigofera linifolia, but are slightly "superior in this respect (*i.e.* high proteid value) to the former though inferior to the latter. "All three kinds, it will be seen, are amongst the most nitrogenous of all seeds, even amongst "the pulses, being excelled only by the lupine." He gives the following analysis:—

Water	8·2
Albuminoids	31·9
Carbohydrates	46·7
Oil	2·2
Fibre	7·8
Ash	3·2

13576.

This analysis corresponds closely with ours, except in that we find the proteid value somewhat higher, and the carbohydrate value correspondingly less. With his remark as to the proteid value being exceptional we concur, not knowing any other vegetable food that has so large an amount of proteid in its composition. As already stated, we ascertained that only a trivial amount of the nitrogen was in the form of extractives which could be dissolved in alcohol.

Kasaiya.—Our analyses as well as those of Dr. Church show that this is a food specially rich in proteids and fats. When separated from its very hard husk it should form a food of great value, especially as its energy-value is the highest of all the foods studied.

Professor Church writing of this food says:—"Throughout Assam and in the eastern fron-"tier lands of India, this coarse cereal constitutes an important food of the hill tribes, replacing "to some extent the millet of Northern and Southern India. . . . The grains of wild kinds "are exceedingly hard and are used as beads, those of the cultivated variety are much softer "and more easily husked."

He gives the following analyses of two varieties:—

Water	13·2	14·8
Albuminoids	18·7	16·6
Starch	58·3	60·1
Oil	5·2	5·8
Fibre	1·5	0·9
Ash	2·1	1·8

3. The third group characterised by being poor in proteid contains two members, *Theck Root* and *Bid Root*. They both contain much less proteid than any of the other foods included in the table, they both have only a small amount of fat, and both have a large amount of soluble carbohydrate. They both more nearly resemble in composition dissicated potato or other dried bulbs than they do cereals.

C.—*Special Characteristics of certain of these Foods.*

In the reports of Mr. Barucha and Mr. Garda certain special characteristics of some of these foods are noted, many of them having distinct pharmacological actions. The principle of these are noted.

The grains of the different species of Panicum, as well as Doda flower all appear to be free of any toxic action.

While according to Mr. Barucha the seeds of Eleusine Ægyptiaca, Mali are harmless, and amongst the most valued of the grains, Mr. Garda reports of the same plant as Anchu Manchu that the taste is not good, that it is so bad that even after grinding and baking it is difficult to masticate, that it is constipating and produces flatulence, and that its use is sometimes followed by suppression of urine. Such a description is suggestive of distinct toxic action.

Zinjroo.—Mr. Barucha reports that alone it cannot be used for making bread, that it is reported by the Bhils to be "heating," and that it "stuffs the belly without relish." These properties may be ascribed to its composition. In Zinjroo carbohydrates are to proteid as 1 to 1, while in oatmeal they are as 4 to 1, and in wheatmeal nearly as 6 to 1.

Theck Root.—Mr. Garda reports that "Theck Root has its bad effects as it is too costive and too cold." These two ill effects can both be explained by reference to its composition. The costive action may be due to its apparently containing very little indigestible matter, the small amount of proteid and the small amount of fibre warranting that opinion. Its being reported to be "too cold" may be ascribed to its small proteid value, for the deficiency of proteid would almost certainly lead to a poor condition of the general nutrition, and that would in popular language be described as being "too cold."

Bid Root.—Mr. Garda reports that some natives habitually live on it for about six months of the year and thrive on it, while those natives who used it for a first time during the recent famine suffered a good deal, getting swollen feet and hands and even ultimately dying of the evil effects. Mr. Garda attributes this difference to the more skilful preparation in the hands of the habitual Bid eater. The root when found is covered by hairs, and it is to them that Mr. Garda attributes the toxic actions. Another explanation is suggested by a study of its composition, and that is, that the ill effects are due to chronic proteid starvation. Bid contains a very small quantity of proteid, and, were a man restricted to its use, it is probable that the want of an efficient supply of proteid would result in a general lowering of nutrition. The absence of evil effects in habitual Bid eaters will be referred to later.

Ghitolas.—Mr. Garda reports that the use of these seeds as a food is limited to one seer *per diem* as more "produces cold and cough." This description by Mr. Garda is suggestive that Ghitolas have a distinct toxic action which generally resembles that of the iodides. To what this is due we have not investigated. It is noteworthy because this toxic action prevents Ghitolas being used in sufficient quantity to supply a full day's ration.

(5.)—THE VALUE OF THE DAILY RATION OF SOME OF THE FOODS.

Mr. Garda and Mr. Barucha state how much of certain of these foods is required by a man *per diem*, and on their statements we construct the tables which are given below. We cannot hold ourselves responsible for the accuracy of those observers as to the daily ration, and we think it right to point out that there are considerable differences between their estimations. For instance, both observers write regarding Samo; the one assesses the daily ration at 2½-3 lbs. (1022-1363 grammes), the other at 1½-2 seers (700-933 grammes). Further Mr. Barucha's estimates are all higher than Mr. Garda's. Mr. Barucha expresses quantity in pounds, Mr. Garda in seers. We might have ascribed this discrepancy to our having mistaken the value of the seer referred to, had we not official information that the seer under question was the weight of 40 rupees, which is 1 lb. 3 oz. Troy, or 466·5 grammes, or rather more than 1 lb. Avoirdupois.

Another and even greater difficulty in discussing the results shown in the tables is to formulate a standard for comparison. Such a standard should be based on what is known to be the food requirement of the particular class of people under consideration. A knowledge of European and American dietaries, however, is of some service in this respect. We know that the labourer in Europe or America, doing moderate work, requiries a diet containing about 118 grammes of proteid, and yielding 3,500 Calories of energy, to properly nourish him. We know that a food requirement varies with the size of the individual, with work, and, to some extent, with climatic surroundings. Now the Bhils are smaller than the average European labourer; in famine time they are presumably not working hard, and they are living in a warmer climate, hence it is safe to assume that their standard of requirement is less than that of the European labourer. Taking the average Bhil man at 20 per cent. lighter than the European, 120 *versus* 145 lbs., the energy value of his standard diet will be 20 per cent. less than 3,500 Calories, *i. e.*, 2,800 Calories. Assuming that his work is essentially light, the study of American diets shows that a further 20 per cent. may be deducted further reducing the standard to 2,240 Calories.

If the proteid in the diet is to bear the same relation to the energy value as it does in the European labourer's diet we conclude that the Bhil's daily requirement of proteid is 77 grammes. The following information given us by a tea planter in Ceylon throws light upon the question. He states that the coolies average about 120 lbs. in weight, and that the allowance of rice on which they live is 64 lbs. a month, *i.e.*, 29 kilos, or, roughly, 1 kilo a day.

According to our informant they do not eat the whole of this, but exchange some for Chilis and other flavouring ingredient. One kilo of rice daily contains—proteids 80 grammes, fat 3 grammes, carbohydrate 790 grammes, and yields 3,595 Calories of energy. Upon this the coolies are capable of doing very hard work day after day such as carrying a weight of 60 lbs. for 30 miles a day.

But the digestibility of the food is a factor which must be taken into consideration in fixing a standard of requirement. Hence the mere fact that these foods are purely vegetable necessitates that the supply of energy should be in excess of that required in a mixed diet. But vegetable foods vary in their digestibility, even when cooked in the same way, and in deciding on the value of these famine foods as a source of energy it was necessary to compare their availability with that of some well-known cereal. The cereal selected was wheat, and with this, three of the more important foods were compared Samo, Zinjroo, and Battairioo.

The method of testing the digestibility was as follows: 5 grammes of the food, finely triturated in a mortar, were taken and boiled for 30 minutes with 300 c.c. of water, allowed to cool and then 10 c.c. of liquor pepticus and 0·2 per cent. hydrochloric acid were added and the mixture kept at a temperature of 38° centigrade for four hours. After this, the mixture was made alkaline by the addition of carbonate of sodium and 5 grammes of taka-diastase added, and then again kept at a temperature of 38° centigrade for 3 hours. During the course of digestion the mixture was, by a mechanical means, kept in constant agitation. After these digestions the undigested proteid in the insoluble residue was estimated by determining the nitrogen by Kjeldahl's method, and from it the digested proteid was estimated by difference. The digested carbohydrate was estimated from the amount of glucose found to exist in the filtrate. For comparison we applied these methods to wheatmeal. The results are shewn in Table 2.

TABLE 2.

Relative Digestibility of Wheat, Samo, Battairioo, and Zinjroo.

	Proteid.		Carbohydrate.	
	Per cent. in Food.	Per cent. Digested.	Per cent. in Food.	Per cent. Digested.
Wheat	10·18	84	71·0	45
Samo	10·68	33	51·2	26
Battairioo	11·90	34	47·89	30
Zinjroo	36·12	83	38·75	28

The close correspondence in the results with the two very similar grains, Samo, and Bottairioo, vouches for the accuracy of this method for comparative purposes.

Taking the percentage of proteids and carbohydrates in these substances, and the amount digested in these experiments, it appears that the availability of the proteids and carbohydrates after such a uniform digestion may be represented as follows:—

Available proteids and carbohydrates in 100 parts of—

	Proteids.	Carbohydrates.
Wheat	8·5	31·9
Samo	3·5	13·3
Battairioo	4·4	14·4
Zinjroo	29·9	10·9

The *relative* available energy may be, calculated from the above table so far as proteids and carbohydrates are concerned—

Wheat	166
Samo	69
Battairioo	77
Zinjroo	167

As a source of available energy from these constituents Zinjroo may be considered equal to wheat, while the two grains of Panicum are of less than half the value.

The lowness of the available energy of Samo is supported by the statement of Mr. Barucha that 2¼ to 3 lbs. of Samo, with a theoretical energy value of 3,086 to 4,116 (mean 3,601) Calories is required by men who can subsist on 1½ to 2 lbs. of maize, yielding from 2,467 to 3,290 (mean 2,878) Calories.

Another factor affecting the availability of such food is that excessive use of a single cereal seems to lower its digestibility. One of us, when investigating the feeding of prisoners in Scottish prisons, found that, when oatmeal was used in moderate amount it was readily digested but when moderation was exceeded the digestibility was greatly reduced. (*See* Dunlop on Prison Dietaries, Laboratory Reports of the Royal College of Physicians, Edinburgh, Volume VIII, 1900, also as Parliamentary Report, C.9,514, 1899.)

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1. In taking 77 grammes of proteid and 2,240 Calories of energy as probably about the minimum requisite for the famine diet of Bhils, we intend to imply that such a diet is the smallest which will theoretically keep a man under the particular circumstances and doing essentially light labour in proper nutrition. But in taking this standard we do not allow for the probable indigestibility of these foods used by themselves, and we are not surprised to find, that of many of these foods the amount which has by experience been found necessary is considerably above our standard.

In Table 3 and 4 we show the food values of the daily rations of these foods. From them we exclude those foods the use of which is restricted by toxic action.

TABLE 3.

Showing Food Value of Daily Rations of non-toxic Foods.

Seed.	Authority.	Lbs. or Seers.	Grammes.	Proteid.	Fat.	Carbohydrate.	Calories.
Samo ...	Garda ...	1¾ seers ...	700	74·4	36·4	358·1	2,107
,, ...	,, ...	2 ,, ...	933	99·6	48·5	477·3	2,808
,, ...	,, mean ...	1¾ ,, ...	816	87·1	42·5	417·7	2,452
,, ...	Barucha ...	2½ lbs. ...	1,022	109·1	53·1	522·8	3,086
,, ...	,, ...	3 ,, ...	1,363	145·5	70·9	697·3	4,116
,, ...	,, mean ...	2⅝ ,, ...	1,187	127·3	62·0	610·1	3,601
Podru ...	,, ...	2¼ ,, ...	1,022	107·3	47·0	430·1	2,640
,, ...	,, ...	3 ,, ...	1,363	143·1	62·7	573·9	3,522
,, ...	,, mean ...	2⅝ ,, ...	1,187	125·2	54·8	502·0	3,080
Battairioo ...	Garda ...	2½ seers ...	1,166	138·7	42·0	558·4	3,248
Doda Flowers ...	,, ...	1½ ,, ...	700	105·3	53·2	287·6	2,094
Theck Root ...	,, ...	1¾ ,, ...	700	15·9	4·1	577·2	2,469
,, ...	,, ...	2 ,, ...	933	21·2	5·4	769·3	3,291
,, ...	,, mean ...	1¾ ,, ...	816	18·5	4·7	623·3	2,880
Bid Root ...	,, male ...	1½ ,, ...	700	28·8	7·0	533·3	2,385
,, ...	,, ,, ...	2 ,, ...	933	38·4	9·3	710·7	3,158
,, ...	,, mean ...	1¾ ,, ...	816	35·6	8·1	622·1	2,771
,, ...	,, female ...	1¼ ,, ...	583	24·0	5·8	444·0	1,975
,, ...	,, ,, ...	1½ ,, ...	700	28·8	7·0	533·3	2,385
,, ...	,, mean ...	1⅜ ,, ...	641	26·4	6·4	488·7	2,179
Kasaiya ...	Barucha ...	1½ lbs. ...	681	128·0	42·0	405·2	2,574
Endoo Pendoo ...	Gaada ...	2½ seers ...	1,166	138·7	48·6	543·3	3,246

In the above tables the difference between daily requirement as estimated by Mr. Barucha and as estimated by Mr. Garda is very evident. The average of Mr. Barucha's estimates of all of these is worth 121 grammes of proteid and 3,340 Calories of energy, that of Mr. Garda's 71·7 grammes of proteid and 2,568 Calories. Mr. Garada's estimates being the more comprehensive are taken first. We consider them seriatim.

1. *Samo.*—Average ration 816 grammes, Proteid, 87·1, Fat, 42·5, Carbohydrate, 417·7, Calories, 2452. The value of the daily ration of this food very closely corresponds with what, on hypothetical grounds, we have stated as a propable standard. Were Samo as easily digested as other cereals, it seems that the mean daily ration as estimated by Mr. Garda, *viz.*, 1¾ seers or 816 grammes might be sufficient to keep a small man doing essentially light work in proper nutrition. The energy value of the ration is somewhat above that of the standard but the consideration of the relatively small availability of Samo renders it probable that the ration of Samo is to be regarded rather as just sufficient to maintain life than to support even light labour.

2. *Battairioo.*—Ration 1,166 grammes, Proteid, 138·7, Fat, 42·0, Carbohydrate, 558·4, Calories, 3,248. The value of this ration of this food is very considerably larger than both our standard and the value of the Samo ration. Why this should be so is not evident from chemical analysis. A 2½-seer ration of this food has a food value of about 33 per cent. more than that of the daily ration of Samo. The bulk of the diet is so great that in all probability the full ration of 2½ seers, 1,166 grammes could not be used.

3. *Endoo Pendoo.*—Average ration 1,166 grammes Proteid, 138·7, Fat, 48·6, Carbohydrate, 543·3, Calories, 3,241. In all particulars this closely resembles the ration of Battairioo.

4. *Theck Root.*—Ration 816 grammes, Proteid 18·5, Fat, 4·7, Carbohydrate, 623, Calories, 2,880. Mr. Garda assumes the daily ration as the same as for Samo, namely, 1½ to 2 seers, Chemical analysis, however, shows that it compares unfavourably with Samo because it contains

only a very small percentage of proteid. The proteid value of Mr. Garda's daily ration is 80 per cent. less than our standard of 77 grammes and it cannot be considered as a satisfactory food when taken alone. A note in Mr. Garda's statement regarding this food shows that it is not found very satisfactory, for he says that it is found "too cold for the constitution." From the composition of Theck we conclude that it is ill adapted for use as a single food, because were the ration increased to the full eating powers of a man, even then the proteid allowance would be so small as to be decidedly insufficient. Theck, however, is a food possessed of large energy value, and if used in combination with some proteid rich food, as, for instance, one of the pulses, or Zinjroo, or Kasaiya, it is an excellent basis for a diet.

5. *Bid Root.*—Ration 816 grammes, Proteid, 35·6, Fat, 8·1, Carbohydrate, 622·1 Calories, 2,771. This food resembles Theck in having a small proteid value and a large energy value, it, however, differs from theck in that its proteid value is not so extremely small. We had no hesitation in asserting that the proteid value of theck root was so small as to prevent its use as an efficient single food. In Bid the proteid ration is 50 per cent. below the standard, so that it too is unsuitable as a single food, but like theck if combined with a proteid rich food it would make an excellent basis of a diet.

There are two interesting points regarding the daily ration of Bid mentioned in Mr. Gardas report, the one a comparision of the male and female requirements, the other the fact of the existence of persons who annually live on this food for a great part of the year. The proportion which the food requirement of a women bears to that of a man is a matter which has been carefully studied by Dr. Atwater of the United States Board of Agriculture, and he has assessed it as 8 to 10, or, in other words, that a proper ration for a woman is four-fifths of that of a man. Now it is certainly of interest to note that Mr. Garda had from quite independent observation assessed these rations in the same proportion, or at all events in as nearly the same proportion as his weights permit of, for he rightly does not commit himself to small fractions of the seer. This observation is of special value in enabling us to place confidence in Mr. Gardas other observations.

The other special point mentioned was the existence of habitual Bid eaters. Mr. Garda's statement (*vide* page 13) appears to indicate that the use of Bid by these people is often combined with the use of other foods, *e.g.*, ghitolas, wheat, barley, all of which have greater proteid values. However, Mr. Garda certainly indicates that Bid can be, and is, used as a single food for long periods without apparent harm. If this is so it is a matter of scientific importance, as it affords a good observation of how small the daily allowance of proteid can be reduced without causing much, if any, harm, and if properly corroborated it would be accepted by physiologists as a valuable indication of the requsite minimum daily proteid allowance for health.

6. *Doda Flower.*—Ration 700 grammes, proteid 102·3, Fat, 532, Carbohydate, 287·6, Calories, 2,094. Of the non-toxic foods Mr Garda selects this as being capable of nourshing a man properly with the smallest ration. Factors which may explain this special value of Doda Flower as a food are the high percentages of proteid and fat which it contains. The actual proteid value of the ration is in excess of our hypothetical standard, while its energy value approximates to that standard, being only 7 per cent. below. That Mr. Garda is able to report that so small a ration can properly nourish a man, and that we find that that small ration very nearly satisfies our hypothetical standards, are sufficient to warrant the opinion that Doda Flower is an excellent food.

Three of Mr. Barucha's daily rations are included in Tables 3 and 4, these are the rations of Samo and Padru and Kasaiya. His estimations are higher than those of Mr. Garda. In writing of Samo he estimates the daily ration as fully 40 per cent. higher than Mr. Garda does and his estimate shows a diet of about 30 per cent. higher than our standard. Similarly with Podru, his daily ration is found to have a food value much in excess of the average of Mr. Garda's estimates and much in excess of our standards. We do not pretend to be able to explain this discrepancy, but it is possible that Mr. Barucha has made his estimate of the amount of these foods the people will eat if they can get them, while Mr. Garda in most cases has estimated the amount they are able to subsist on during a period of famine.

In the case of Kasaiya his estimate is not so high and approaches more to our standard. From the proportion of the various constituents it appears to us essentially a valuable food, and the fact that it must be completely freed from the hard husk before it is used, probably renders it easily digestible and largely available.

TABLE 4.

Showing food value of daily rations of certain foods the use of which appears to be limited by their toxic properties.—

Food.	Authority.	Ration.		Proteid.	Fat.	Carbohydrate.	Calories.
		Seers.	Grains.				
Ghitolas...	Garda ...	1 seer ...	466	43·3	3·6	31·1	1,486
Anchu Manchu	,, ...	1½ seers ...	700	90·1	14·6	443·2	2,342

7. *Ghitolas.*—The ration, as limited by the toxic action of the food, is too small for proper nutrition. Both the proteid and energy values are less than our standard, and less than those of the rations of non-toxic foods such as Samo and Doda Flower. Consequently Ghitolas, as a food, is of more limited value than others included in this report.

8. *Anchu Manchu.*—From chemical analysis it would appear that the ration of this food is ample. The apparent food value exceeds that of our standard and that of other foods. Its possible toxic effects may make it an undesirable food, but in the light of what Mr. Barucha says of it under the name of Mali, in all probability this is of little moment.

9. *Zinjroo.*—As this is seldom, if ever, eaten alone it is unnecessary to report on it as a single food. It should, however, form a most valuable addition to some of the other foods in which the proteids are small in amount and not readily digestible, since we find that its proteids are as fully digested as those of wheat.

10. *Kodri.*—The food value of Kodri still remains for consideration. Our reason for excluding it from tables 3 and 4, is that neither of the reporters, Mr. Garda nor Mr. Barucha, have stated its daily ration. This being so, all we can do is to state what, in our opinion, should be minimum allowance.

It differs from the other foods submitted in not being a single grain, but a preparation that can be made from other grains, Mali and Zinjroo excepted. The sample submitted was made from Samo, and was, in fact, Samo without part of the husk. The result of this manufacture is to increase both the proteid and energy values, and consequently an efficient diet can be got from a smaller ration of Kodri than from Samo. Calculation shows that a diet of 670 grammes (about 1½ lbs. or rather less than 1½ seers) will yied 94 grammes of proteid and 2,425 calories of energy, and thus be fully equivalent to a daily ration of 816 grammes of Samo.

(6)—GENERAL CONCLUSIONS.

1. Many of these food-stuffs appear to be well adapted for human food, and of these Samo, Battairioo, Doda Flower, Kasaiya, Podru, and Kodri appear to be the best.

2. Ghitolas, Anchu Manchu, and Zinjroo have a more limited use as toxic properties have been ascribed to them.

3. Bid and Theck root, from their poverty in proteid, are not well adapted for use as single foods.

4. A daily ration of 1 lb. 13 oz. Avoirdupois, or 1¾ seers or 816 grammes of the more nutritious foods, should theoretically be sufficient to maintain a small man of about 120 lbs. weight, doing light work and living in a warm climate.

5. The daily ration may be reduced to 1 lb. 9 ozs. or 1½ seers or 700 grammes when Doda Flower, Kodri, or Kasaiya are the foods used.

MEMORANDUM.

Government having directed a reprint to be made of the list of wild plants and vegetables, used as food by the people in famine times, with the Telugu synonyms and the additions noted in Proceedings of the Board of Revenue, No. 3121, dated 3rd July 1877, the following revised list is published, as desired by Government.

(Signed) W. R. CORNISH, F.R.C.S,
Sanitary Commissioner for Madras.

From Surgeon-Major J. SHORTT, M.D., Inspector of Vaccination, Madras Presidency, to the Sanitary Commissioner of Madras, dated 3rd May 1877, No. 263.

I have the honor to submit a list of most of the wild plants, their roots, leaves, fruits or seeds that are eaten by the poor during seasons of drought and famine. I give both the scientific, Tamil and Telugu names in the list, believing that it may prove of interest just now.

2. I commenced the collection first during a visit to Ganjam in 1870, and have to thank G. H. Ellis, Esq., and J. G. Thompson, Esq., the then Collector and Judge of that district who kindly at my request procured for me several specimens for identification. Since that I have been adding to the number, and during a tour to the Bellary, Kurnul, and Cuddapah Districts in December 1876, at the onset of the present famine, and in the North-Arcot and Salem Districts during 1877, I collected further information.

3. The list is alphabetically arranged; many of the leaves and young shoots of those used as greens are much more frequently used as *Calavay Keeray* or mixed greens. This is a favorite mode of using them at all seasons, and they are in great repute even among well-to-do people. Women collect the wild greens both as an amusement and occupation, adding at the same time an additional dish to the family meal. Many European and East Indian families are partial to them, as they are said to be healthy and to have a slight laxative action on the bowels that they will frequently send their female servants out to collect them.

4. The tender pith and leaf-bud of the Hedge Aloe is only eaten by the poor from great pressure of hunger, as it is unwholesome and causes dysentery and diarrhœa.

5. Some of the Arum tribe that are used on these occasions are not only unwholesome but poisonous; to avoid their deleterious effects they are repeatedly boiled ere eating. Of the various fruits they are eaten ripe as they come into season. The Banian, Peepul, and country fig furnish food not only to the poor people but to cattle also. The kernel of the mango and the tamarind stone are converted into meal and cooked into porridge or baked into cakes, but as they contain a large proportion of tannin they are not healthy and are only resorted to during seasons of scarcity. The bamboo seed furnishes a kind of rice, which is generally collected by the poor during the season at all times to keep them in food. In most jungles there is always a succession of bamboo in seed every year. The fruit of the prickly-pear is eaten ripe; sometimes the green fruits are boiled. The tender leaves would furnish good vegetable for curry but is not often resorted to as the prickly-pear possesses sub-acid or anti-scorbutic properties; it is very beneficial to the health both of man and beast. To Mr. H. S. Thomas, the Collector of Tanjore, the credit is due of first suggesting and subsequently demonstrating practically its value as cattle fodder by feeding his own cattle on it and exhibiting the same in public, thus proving its utility and it has been introduced to public notice by Messrs. Harvey and Sabapathy of Bellary since. It has not met with general acceptance in consequence of the trouble and difficulty of freeing the leaves of their sharp spines, but there is a spineless variety—*Opuntia delenii* or Nopaul with red flowers—which is met with about Madras. I remember seeing lots of it growing about the village of Karanguli, in the District of Chingleput, some years ago. It would be worth while introducing this cactus into the several districts to form cattle fodder not only during seasons of scarcity, but at all other times.

NOTE.—This variety of Opuntia was introduced many years ago by the late Dr. James Anderson to feed the cochineal insect. Dr. Anderson used to supply Her Majesty's ships-of-war in the Madras roads with the green leaves, which in those days were used as an anti-scorbutic, after being boiled as an ordinary green vegetable.
W. R. C.

The *Guazuma tomentosa*, or Bastard Cedar, was introduced into Southern India from South America very many years ago, to be cultivated for supplying cattle with fodder; they are met with about Madras. The woody seeds are sweet from containing sugar, and they are eaten by the poor during seasons of scarcity, but cattle are partial to both leaves and fruits. This tree also yields good fibre, and its extensive cultivation into the several districts is well worthy of attention with a view to supply fodder for cattle during seasons of scarcity. The Bassia, of which there are two varieties, from the fleshy corolla of which most of the semi-

wild tribes distil their arrack, the flowers being sweet tasted are eaten raw, boiled or roasted, and the ripe fruits during the season. The kernels furnish a coarse oil, which is used as food. The palmyra tree is too well known for the various useful products it furnishes. The fusiform root of the germinating stone is boiled and sold in the bazaars during the season as the palmyra tubers or *Pannei Kulungu*, this is also converted into meal, and the stones of the fruit are carefully collected and put down to germinate for the purpose of securing the roots.

I will not extend these remarks further as the parts used and the mode in which they are prepared are given opposite each plant.

NOTE.—Since this letter was written I have been to the North Arcot District on a tour of inspection, and at the Village of Polur in that district saw several large clumps of the Nopaul or Nonspinous cactus growing in a tope. The Tahsildar being absent, I sent for the Sheristadar or Sub-Magistrate, and pointed out the Nopaul to him. I brought with me several specimens of the young plant, and, on receiving a note from Mr. Fernandez of the Government Office on the subject, I sent these plants to him to present to the Chief Secretary to Government.

At Vellore near the toll-gate, leading towards the Central Jail, I also saw several young plants of the Nopaul growing in a hedge with the common Spinous cactus.

In Madras there is a fine specimen of the Nopaul to be seen in a House No. 31, on the High Road, Royapuram, and another in the compound of Trinity Chapel, John Pareira's, both these plants were with flower and fruit when seen by me about two months ago.

A List of Plants the various parts of which are used as Food by the Poor, during seasons of Distress, to appease the cravings of Hunger.

Kanarese Names.	Scientific Names.	Tamil Names.	Telugu Names.	Remarks.
1. Kuppi gida (ಕುಪ್ಪಿ ಗಿಡ.)	Acalypha Indica	Koopay maynei	Hurita munjari	Grows wild, leaves used as greens.
2. Uttarani gida (ಉತ್ತರಾಣಿ ಗಿಡ.)	Achyranthes aspera	Nahi ooroovie keeray	Ooteriynie	Do do
3. Bili hindi soppu (ಬಿಳೀ ಹಿಂಡಿ ಸೊಪ್ಪು.)	Arua lænata	Kunpolay keeray	Pindie conda	Grows wild, and cultivated, the leaves eaten.
4. Agase soppu (ಅಗಸೆ ಸೊಪ್ಪು.)	Agati grandiflora	Aghati keeray	Agisi, Bakapushpam	Leaves, flowers, and tender legumes largely consumed by the poor, sold in the bazaars at one pie the pound; when freely eaten, causes diarrhœa.
5.	Æschynomene aspera	Sudday keeray	Jilugu benda	Grows wild, the leaflets used as greens.
6. Lolisara gida (ಲೋಳಿಸರ.)	Aloe vulgaris	Kuthalay	Kalabanda	Grows wild, the leaf-bud or cabbage and tender pith eaten. The common food of villagers during the famine.
7. Honagone soppu (ಹೊನಗೊನೆ ಸೊಪ್ಪು.)	Alternanthera sessilis	Poonanghacuuny keeray	Madanaganti, Ponnaganti	Grows wild, leaves used as greens.
8. Chilkarive soppu (ಚಿಲ್ಕರಿವೆ ಸೊಪ್ಪು.)	Amaranthus campestris	Siru keeray	Teseri kura	Grows wild, and cultivated used as greens.
9. Harive soppu (ಹರಿವೆ ಸೊಪ್ಪು.)	,, gangeticus var inamous.	Poong keeray	Tota kura	Grows wild, and cultivated, leaves used as greens, and the seeds converted into meal.
10. Mullu dantu (ಮುಳ್ಳು ದಂಟು.)	,, spinosus	Mooloo keeray	Mulugoranta	Grows wild, leaves eaten as greens.
11 Daggali soppu (ದಗ್ಗಲಿ ಸೊಪ್ಪು.)	,, tenuifolius	Kattoo Siroo keeray	Doggali kura	Grows wild, used as greens.
12.	,, tristis	Kuppei keeray	Koyyatota kura	Do do
13.	Amorphophallus campanulatus.	Kurruna kalungu	Konda, muchu kanda	Do about hills and forests, and the tubers boiled and eaten.
14.	Aponogeton monostachyon.	Kotee kalungu	Nama	Grows wild, found in tanks, brooks, and nullahs; tubers boiled and eaten.
15.	Arum lyratum	Kondai rakis	Konda rakis	The roots are eaten after careful boilings.
16.	Asystasia coromandeliana	Midchy keeray	Mukku mungera; Tappeta	Grows wild, used as greens
17. Sakotti soppu (ಸಕ್ಕೊತ್ತಿ ಸೊಪ್ಪು.)	Atriplex heteranthera	Thoyah keeray	Thoya kura	Do do

A List of Plants the various parts of which are used as Food, &c.—(continued).

Kanarese Names.	Scientific Names.	Tamil Names.	Telugu Names.	Remarks.
18. Bidiru (ಬಿದಿರು).	Bambusa arundinacea ...	Mungil arisee ...	Veduru ...	Seeds of the bamboo furnish food (rice) to the poor and the growing young shoots cooked into curries.
19. Kádu ippemara. (ಕಾಡು ಇಪ್ಪೆಮರ).	Bassia longifolia ...	Elloopei ...	Ippa ...	Grows wild, the deciduous fleshy corolla eaten, either raw or roasted, and the fruits when ripe. The seed contains a bland oil used in cooking.
20. Ippemara (ಇಪ್ಪೆಮರ).	,, latifolia ...	Caat elloopei ...	Ippe ...	Do do do
21. Kari béyu ... (ಕರಿಬೇವು).	Bergera K ...	Karawa[illegible]lay ...	Kari vepa ...	Do cultivated, fruits eaten.
22. ...	Boerhavia procumbens ...	Mookaretti keeray ...	Ataka mamidi ...	Grows wild, leaves and tender shoots used as greens.
23. Bekkina ajje balli ... (ಬೆಕ್ಕಿನ ಅಜ್ಜೆಬಳ್ಳಿ).	Boerhavia repanda ...	Mookooty keeray ...	Maidinika ...	Do do do
24. Tále mara ... (ತಾಳೆಮರ).	Borassus flabelliformis ...	Pannei ...	Karatalamu, Tatichettu ...	Fruits and leaf-bud or the cabbage is eaten, as also the fusiform roots.
25. ...	Bryonia rostrata ...	Appa kovay ...	Putribudinga ...	Grows wild, fruits and leaves eaten.
26. Harive soppu ... (ಹರಿವೆಸೊಪ್ಪು).	Byttneria herbacea ...	Aree keeray ...	Aree kura ...	Grows wild, leaves used as greens.
27. Kesave dantu (ಕೆಸವೆ ದಂಟು).	Caladium esculentum ...	Saimmay keeray ...	Chama kura ...	Grows wild, leaves eaten as greens.
28. Káre gida ... (ಕಾರೆಗಿಡ).	Cantheum parvifolia ...	Carray cheddie ...	Balusoo kura ...	Grows wild, leaves and young shoots used as greens.
29. ...	Cardiospermum halicacabum.	Moodacottan ...	Budda kankarakoo, or Nella goolisienda.	Do do do
30. ...	Caralluma adscendens ...	Kullee mooliayan ...	Karallamu, Taviti chettu.	Do tender shoots used, cooked as vegetable.
31. Korinda gida ... (ಕೊರಿಂಡ ಗಿಡ).	Carissa corindas ...	Kalakai ...	Wakay oka chettu ...	Grows wild, fruits are eaten.
32. ...	,, diffusa ...	Chothay kalakai ...	Kalive chettu ...	Do do do
33. ...	Cassia sophera ...	Poonaverie ...	Pydee tanghadu ...	Do leaves used as greens.
34. Kakke mara ... (ಕಕ್ಕೆ ಮರ).	Cathartocarpus fistula ...	Koonnay ...	Rela ...	Grows wild, the mucilagenous pulp from the pods eaten.
35. Anne soppu ... (ಅಣ್ಣೆ ಸೊಪ್ಪು).	Celosia cristata ...	Punnee keeray ...	Erra kodi, Juttu tota kura	Grows wild, leaves and young shoots used as greens.
36. Mangaruvalli balli (ಮಂಗರುವಳ್ಳಿ ಬಳ್ಳಿ).	Vitis quadrangularis ...	Purundei-codie ...	Nullerootigch ...	Do do do
37. ...	Cleome pentaphylla ...	Valay keeray ...	Vaminta ...	Do leaves used as greens.
38. Tonde balli ... (ತೊಂಡೆಬಳ್ಳಿ).	Coccinia Indica ...	Covay kai ...	Donda, Bimbika ...	Grows wild, ripe fruits eaten.
39. Kesave dantu ... (ಕೆಸವ ದಂಟು).	Colocasia antiquorum ...	Shamay kilangu ...	Chama dumpa ...	Grows wild, and cultivated, leaves and leaf-stalks eaten.
40. Karnagadde ... (ಕರ್ನಗಡ್ಡೆ).	,, nymphæfolia ...	Karoonay kilangu ...	Gadda kanda ...	Grows wild, and cultivated, the tubers are cooked.
41. Kanne soppu ... (ಕನ್ನೆಸೊಪ್ಪು).	Commelyna communis ...	Kannang keeray ...	Gangi gadda ...	Grows wild, leaves and tender shoots used as greens.
42. Solle (kendal) mara ... ಸೊಳ್ಳೆ (ಕೆಂದಲ್) ಮರ.	Cordia Myxa ...	Vidi maram ...	Iriki, Nakerachettu ...	Fruits eaten during the season.
43. ...	Corchorus olitorius ...	Kaat thoothee, or Jews' Mallow.	Parinta ...	Grows wild, leaves and tender shoots, used as greens.
44. Halmakke balli ... (ಹಾಲ್ಮಕ್ಕೆ ಬಳ್ಳಿ).	Cucumis momordica ...	Kaat velleri, Pythum kai.	Pedda doskay ...	Grows wild, fruits eaten.
45. Garike hullu ... (ಗರಿಕ ಹುಲ್ಲು).	Cynodon dactylon ...	Arroogum pillo ...	Garike ...	Do tender leaves and shoots eaten.

A List of Plants the various parts of which are used as Food, &c.—(continued).

Kanarese Names.	Scientific Names.	Tamil Names.	Telugu Names.	Remarks.
46. ...	Desmanthus natans ...	Sunday keeray ...	Niru talvapu ...	Grows wild, the leaves used as greens.
47. Mudi genasu ... (ಮುಡಿ ಗೆಣಸು.)	Dioscorea alata ...	Yams kalung ...	Niluva pendalum ...	Several varieties, grows wild, tubers eaten cooked.
48. Tamate gida ... (ತಮಟೆ ಗಿಡ.)	Dolichos ensiformis ...	Kaat Thumbuten ka ...	Tamma ...	Grows wild, pods cooked into curries, ripe seeds eaten boiled.
49. Kádu karna gadde, chúrna gadde. (ಕಾಡು ಕರ್ನ ಗಡ್ಡೆ, ಚೂರ್ನ ಗಡ್ಡೆ.)	Dracontium polyphyllum.	Kaat Curnay ...	Adive kanda ...	Grows wild, tubers eaten cooked.
50. ...	Eleusine Ægyptiaca ...	Muttengapilloo ...	Tamida, Sodee ...	The seed grains are eaten cooked.
51. Bili Bóoraga mara ... (ಬಿಳೀ ಬೂರಗ ಮರ.)	Eriodendron anfractuosum.	Elévam ...	Poor ...	Found in gardens, seeds roasted and eaten.
52. Dévadári gida ... (ದೇವದಾರಿ ಗಿಡ.)	Erythroxylon areolatum.	Davaahdarum keeray ...	Devadary kura ...	The tender leaves are used as greens, grows wild.
53. Atche soppu, Nene akki soppu. (ಅಚ್ಚೆ ಸೊಪ್ಪು, ನೆನೆ ಅಕ್ಕಿ ಸೊಪ್ಪು.)	Euphorbia pilulifera ...	Amumpatchay arisee ...	Bidarie, Nanabeeam ...	Grows wild, leaves and tender shoots eaten as greens.
54. A'lada mara ... (ಆಲದ ಮರ.)	Ficus Bengalensis ...	Alamarum ...	Marri ...	Fruits of these and other varieties of the Ficus are eaten ripe.
55. Atti mara ... (ಅತ್ತಿ ಮರ.)	,, glomerata ...	Attee marum ...	Maydi ...	Do do
56. Arali, rági, Aswatha mara. (ಅರಳಿ, ರಾಗಿ, ಅಶ್ವತ್ಥ ಮರ.)	,, religiosa ...	Arasa marum ...	Ray, Raghie ...	Do do
57. ...	Glinus trianthenioides ...	Sharunnay keeray ...	Golijeru ...	Wild, leaves used as greens.
58. ...	Gisekia pharnaceoides ...	Numnelli keeray ...	Isaka dasari kura ...	Grows wild. The leaves used as greens.
59. Rudrákshi mara ... (ರುದ್ರಾಕ್ಷಿ ಮರ.)	Gazuma tomentosum ...	Rudrasum ...	Rudrakscha chettu ...	The woody fruits when ripe are eaten.
60. Nárambéle soppu ... (ನಾರಂಬೇಳೆ ಸೊಪ್ಪು.)	Gynandropsis pentaphylla	Neivaylla or kadughoo ...	Valla kura ...	Grows wild, leaves and young shoots used as greens.
61. ...	Holostemma Rheedi* ...	Palay keeray ...	Pala kura ...	Leaves boiled with salt and chillies and eaten.
62. ...	Hoya viridiflora ...	Cooringee keeray ...	...	Grows wild, leaves used as greens.
63. Sime hunase mara ... (ಸೀಮೆ ಹುಣಸೆ ಮರ.)	Inga dulcis ...	Coorkapooly ...	Sima chinta ...	Ripe fruits eaten.
64. ...	Ipomœa reptans ...	Vellay keeray ...	Tegada ...	Wild, leaves eaten as greens.
65. ...	,, reniformis ...	Perretay keeray ...	Toinnatali ...	Do do
66. ...	,, sepinaria ...	Thalee keeray ...	Puriti tige ...	Do do
Olle tumbe gida ... (ಒಳ್ಳೆ ತುಂಬೆ ಗಿಡ.)	Leucas aspera ...	Thombay keeray ...	Tummi kura ...	Grows wild, leaves and tender shoots eaten as greens.
68. ...	Maba buxifolia ...	Erimbellie kai ...	Pishanna ...	Grows wild, ripe fruits eaten.
69. Mávina mara ... (ಮಾವಿನ ಮರ.)	Mangifera Indica ...	Mankai ...	Mamedi chettu ...	Fruits and seeds, latter converted into meal.
70. Olle bévina mara (ಒಳ್ಳೇ ಬೇವಿನ ಮರ.)	Melia azadirachta Indica.	Veypa marum ...	Vapa chettu ...	The ripe fruits are eaten as they contain a small quantity of sweet pulp between stone and skin.
71. Pagade mara ... (ಪಗಡೆ ಮರ.)	Mimusops elengi ...	Moghadum ...	Poghada ...	The ripe fruits are eaten.
72. Vibhúti, Nálkughantehú gida. (ವಿಭೂತಿ ಗಿಡ, ನಾಲ್ಕು ಘಂಟೆಹೂ ಗಿಡ.)	Mirabilis jalapa* ...	Undi mandarei ...	Badracha, Nitcha mulligah.	The leaves are used as greens largely at Oossoor in the Salem District.

A List of Plants the various parts of which are used as Food, &c.—(continued).

Kanarese Names.	Scientific Names.	Tamil Names.	Telugu Names.	Remarks.
73. Tagache mara (ತಗಚೆ ಮರ.)	Morinda citrifolia	Munja pavattay	Molagha, Maddi chettu	Grows wild, green fruits curried, ripe eaten.
74.	,, umbellata	Noona kai	Moolooghoodoo	Do do
75. Bili tavare (ಬಿಳಿ ತಾವರೆ.)	Nymphæa edulis	Shungueer pushpum	Koteka, Kalharamu	Grows wild in tanks, there are two or three varieties according to the coloring of the flowers. The roots and seeds are eaten, cooked.
76. Bilvapatre mara (ಬಿಲ್ವಪತ್ರ ಮರ.)	Ægle Marmelos	Vilva marum	Maredoo	Grows wild, the ripe fruits are eaten.
77. Papás kattáli (ಪಪಾಸಿ ಕತ್ತಾಳಿ.)	Opuntia vulgaris	Chuppauth kattali	Naga jamudu	Grows wild, the ripe fruits are eaten and sometimes the green boiled.
78. Pullampurasi soppu (ಪುಲ್ಲಂಪುರಸಿ ಸೊಪ್ಪು.)	Oxalis corniculata	Pooliaray	Pulicinta	Grows wild leaves and tender shoots are cooked and eaten as greens.
79. Gédige gida (ಗೇದಿಗೆ ಗಿಡ.)	Pandanus odorata	Thalay	Mogili	Grows wild, the floral leaves are eaten raw or cooked, and the lower part of the drupes of the ripe fruits are sucked of their pulp.
80.	Phaseolus rostratus	Karalsoma	Karalsama, Karu ala-chanda.	Grows wild, the tuberous roots are cooked and eaten.
81. I'tchalu mara (ಈಚಲು ಮರ.)	Phœnix sylvestris	Ethum pannay	Ita chettu	Grows wild, leaf-bud or cabbage and ripe fruits eaten.
82. Sanna I'tchalu mara. (ಸಣ್ಣ ಈಚಲು ಮರ.)	,, farinifera	Ethee	Chiruta-ity	Do do
83. Dodda goni soppu (ದೊಡ್ಡ ಗೋಣಿ ಸೊಪ್ಪು.)	Portulaca oleracea	Paroopoo or corie keeray.	Pedda pail kura, Ganga pavilli kura.	Grows wild, leaves and tender shoots are cooked and eaten as greens.
84. Basale soppu (ಬಸಲೆ ಸೊಪ್ಪು.)	,, quadrifida	Passelie keeray	Goddu pavelli, Sun pail kura.	Do do.
85. Nugge mara (ನುಗ್ಗೆ ಮರ.)	Premna serratifolia	Mooney do	Ghebboon nellie	Do do
86.	,, latifolia	Nella do	Pedda-nella-kura	Do do
87.	Prosopis spicigera	Parumbay	Chamee, or Jammi chettu	Do the meals from the pods are eaten.
88.	Remna latifolia		Nelli kura	These herbs are gathered and boiled with some salt and chillies and eaten.
89.	Rivea hypocrateriformis	Boodthee keeray	Boddi kura	Do do
90. Bélé kalu soppu (ಬೀಳೀಕಾಳು ಸೊಪ್ಪು.)	Rothia trifoliata	Nurreypitten keeray	Nucka kura	Grows wild, leaves and legumes used as greens.
91.	Salilcornia bracheata	Oomarie keeray	Quoiloo, or Koyaloo	Grows wild, leaves and shoots used as greens.
92.	,, Indica	Pavala poondoo	Koyya pippali	Used as a pot herb.
93.	Salsola Indica	Yella keeray	Yella kura	Wild, leaves used as greens, largely resorted to during famines.
94. Sagade mara, Kodli murka mara. (ಸಗಡೆ, ಕೊಡ್ಲಿ ಮೂರ್ಕ ಮರ.)	Schleichera trijuga	Poomarum, Conjee marum.	May Rao, Tanglia	Grows wild, ripe fruits are eaten.
95.	Schmidelia serrata	Tanalika	Tanalikee korra chettu	Grows wild, fruits are eaten.
96.	Sesuvium portulacustrum	Vungaravasee		The leaves and tender shoots used as a pot herb, grows wild.
97. Devadaru gida (ದೇವದಾರು ಗಿಡ.)	Sethia Indica	Tavadrum, Semmanatty	Adivi gerenta, Devadari.	Grows wild, leaves and tender shoots eaten as greens. This tree has afforded food to many thousands of people during the famine.
98. Kempu kachi, kari kachi gida. (ಕೆಂಪು ಕಾಚಿ, ಕರಿಕಾಚಿ ಗಿಡ.)	Solanum incertum	Munnuthakalee	Kakamachi	Grows wild, leaves, and young shoots used as greens, ripe fruits eaten.

A List of Plants the various parts of which are used as Food, &c.—(concluded).

Kanarese Names.	Scientific Names.	Tamil Names.	Telugu Names.	Remarks.
99. Ráma gulla kàyi (ರಾಮ ಗುಳ್ಳ ಕಾಯಿ.)	Solanum jacquini	Cundung katie	Van kuda, or Nella molunga.	Grows wild, fruits are cooked into curries.
100.	,, toryum	Soonday kai	Choondai kai	Grows wild, fruits used as vegetable.
101. Amate mara (ಅಮಟೆ ಮರ.)	Spondias mangifera	Mirrey manga	Ambra, or amra jouru, Mamedi.	Grows wild, leaves used as greens, fruits cooked into curries and pickled.
102. Bátála, penari mara (ಬಾತಾಳ, ಪೇನಾರಿ ಮರ.)	Sterculia fœtida	Peenarce marum	Gurapa Badam chettu	Grows wild, the roasted seeds are eaten.
103. Chillu mara (ಚಿಳ್ಳು ಮರ.)	Strychnos potatorum	Tettan cottay marum	Toillaghenjaloo, Induga.	Grows wild, fruits when ripe are eaten.
104.	Sida Indica	Koyey kaseeray keeray	Kodee kasseery kura	Used as a pot herb, grows wild.
105.				Grows wild, ripe fruits are eaten.
106.				Leaves young shoots, fruits and seeds are eaten, the latter converted into meal.
107. Kàdu menasu gida (ಕಾಡು ಮೆಣಸು ಗಿಡ.)	Toddalia aculeata			Grows wild, leaves are used as greens.
108.	Trapa bispinosa			Grows wild, seeds are cooked and eaten.
109. Kempu komme soppu (ಕೆಂಪು ಕೊಮ್ಮೆ ಸೊಪ್ಪು.)	Trianthema obcordata	Sharun	Ghelijehroo	Do leaves and tender shoots used as greens.
110. Bili komme soppu (ಬಿಳಿ ಕೊಮ್ಮೆ ಸೊಪ್ಪು.)	,, obcordate var.	Shavalay keeray	Tella ghelijehroo	Grows wild, leaves used as greens.
111.	Trichosanthes cucumeri	Pepoodel	Chayud potta	Grows wild, fruits curried.
112. Sanna neggilu gida. (ಸಣ್ಣ ನೆಗ್ಗಿಲು ಗಿಡ.)	Trilobus terristris	Nerrenji keeray	Palleroo	Do leaves used as greens.
113.	Urtica tuberosa	.....	Pilli dumpa	Grows wild, tuberous roots boiled and eaten.
114.	Vellarsia cristata*	Nedel ampel	Alli gadda, Antara tamara	This is a species of water lily found in tanks and wells. The substance found in the plant is cooked or merely boiled and eaten.
115.	Xanthochymus pictorius	.....	Jevra memadie	Grows wild, ripe fruits.
116. Nagare gida (ನಾಗರೇ ಗಿಡ.)	Ximenia Americana	.....	Oora nechra, Konda nakkera.	Do do
117. Yelachi mara (ಎಲಚಿ ಮರ.)	Zizyphus jujuba	Yellanday kai	Reygoo	Ripe fruits.
118.	Leptadenia reticulata†	Palacoody	Kalasa	The leaves and tender shoots used as a vegetable in the Vinucondah taluk, Kistna, at all times.

† This plant was sent to me by the Collector of Kistna for identification, and "that it was eaten by the villagers of Vinucondah taluk as a vegetable, but which they are now using as food." I have identified it as the Leptadenia reticulata.

(Signed) J. SHORTT.

NOTE.—Names marked thus * are taken from Mr. H. Yarde's (of the Forest Department) list.

MADRAS,
3rd May 1877.

(Signed) J. SHORTT, M. D., Surgeon-Major,
Inspector of Vaccination, Madras Presidency.